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Dento-maxillofacial Radiology in Australia and Dentist satisfaction with radiology reports.

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ABSTRACT

Background: Dento-maxillofacial Radiology (DMFR) is comprised of the smallest cohort of specialists in Australia. A survey was undertaken to assess awareness of DMFR; radiology reporting and referring protocols; as well as dental practitioners' satisfaction with their radiology reporting arrangements.

Methods: An original online survey created using Checkbox†, was sent to dental practitioners. The survey was promoted on Australian-based dental Facebook forums and emailed to targeted members via Australian professional dental associations.

Results: A total of 399 responses were received, with over 80% of respondents aware of DMFR as a specialty. Approximately 40% of practitioners were self-reporting their imaging. There was correlation between increased satisfaction with external reporting and utilization of DMFR services; and decreased satisfaction with medical radiology services. More than 90% of general dentists and greater than 85% of dental specialists prefer DMFR reports to medical radiology reports. Approximately 80% of practitioners believed their satisfaction would change positively if they had access to a DMFR report.

Conclusion: The research indicates a high degree of self-reporting or non-reporting by dental practitioners. There is low satisfaction with external reporting performed by Medical Radiologists primarily due to a lack of dental knowledge or detail; and a preference for DMF Radiology reports.

Keywords: dento-maxillofacial radiology, imaging, oral and maxillofacial radiology, radiology, reporting

Abbreviations and acronyms: AHPRA = Australian Health Practitioner Regulation Agency; CBVT/CBCT = Cone Beam Volumetric Tomography/Cone Beam Computed Tomography; DMFR = dento-maxillofacial radiology; DMFRs = dento-maxillofacial radiologists; DMF = dento-maxillofacial; GDP = general dental practitioner; DClinDent = Doctor of Clinical Dentistry; OPG = Orthopantomogram/Panoramic Radiograph

† Checkbox (Checkbox Survey Solutions Inc., Watertown, MA): http://checkbox.com

INTRODUCTION

Dento-maxillofacial Radiology (DMFR) is the discipline of dental practice which deals with diagnostic imaging procedures applicable to the hard and soft tissues of the oral and maxillofacial region and to other structures which are relevant to the proper assessment of oral conditions.[1] Specialists in Dento-maxillofacial Radiology are titled as Dento-maxillofacial (DMF) Radiologists, Dental Radiologists, or Oral and Maxillofacial Radiologists.

Dento-maxillofacial Radiology sits at the interface between Medical Radiology and Specialist Dentistry, and the field is still in its infancy – being the newest discipline to be counted as a specialty in most countries.[2]

In Australia, DMF Radiologists have worked in varying capacities since the latter half of the 20th Century. As of 2018 there are 11 Australian registered DMF Radiologists, working in Queensland, Western Australia (WA), and Victoria; and there are no permanent DMF Radiologists based in the other States or Territories.

Teaching of DMFR into Australian dental programs was examined in 1988[3] and it was suggested that both undergraduate and postgraduate DMFR education should be improved; with a proposal for the specialty of DMFR to be officially recognised nationally.

It is hypothesised that a substantial portion of Australian dentists are unaware of the specialty. As such it is hypothesised that most extra-oral images are reported by either medical radiologists or by the dental practitioner if they have extra-oral imaging on-site.

The rationale for the existence of the specialty has long been debated, with letters to the British Medical Journal in the 1930's comparing the abilities of medical radiologists and dentists when it came to assessing imaging of the maxillofacial region, suggesting that dentists were more appropriately equipped to report over medial practitioners.[4] The necessity of the specialty was further assessed by Alcox et al. in 1972;[5] showing that approximately 58% of general dentists and 83% of dental specialists would favour the use of a dental radiologist.

Due to a lack of dental education in medical training, the jaws and other tooth bearing regions may not be assessed appropriately for referring dental practitioners[6, 7] . While recent literature has aimed to improve medical radiology training in maxillofacial imaging and interpretation,[8] it is further hypothesised that many dentists are unsatisfied with the level of reporting they receive from medical radiologists. This has been shown in a number of Korean studies examining the differences between dental and medical radiologists, concluding that dental radiologists generally had higher accuracy compared to medical radiologists in interpreting maxillofacial imaging, despite the latter reporting on head and neck imaging as part of their training.[9,10]

There are also medicolegal implications associated with radiology procedures conducted in-house at dental practices such as inappropriate dosage and a failure to diagnose[11]. Further medicolegal considerations are summarised in Table 1. Emphasis was placed on the practitioner's own "self-report" being held to the same standard as a specialist report.

Previous research has highlighted the poor ability of dentists to recognise pathology in the maxillary antrum and temporomandibular joint; [12,13] poor equipment and radiation awareness;[14] and substandard panoramic radiography technique.[15] Despite this, many imaging procedures continue to be being carried out in private dental practices. It is hypothesised that many dentists may feel they have the skills required to interpret radiographs without the need to consult a report from a medical or dental radiologist.

There is little published data on health practitioner satisfaction with radiology reporting, bar a few papers[16, 17] and there is little to no evidence of published work regarding dentist satisfaction with radiology reporting. There are also no contemporary papers examining DMFR as a specialty in Australia including reporting arrangements and dentist awareness of the DMFR specialty in Australia.

Therefore, the aims of this study were to: 1) determine the awareness of the dento-maxillofacial radiology specialty for dentists in Australia; 2) determine the perceived need for outsourced reporting, and 3) investigate subjective satisfaction with outsourced reporting, which is hypothesised to be low.

METHODS

Survey Development

An online survey was developed using Checkbox (Checkbox Survey Solutions Inc., Watertown, MA). A total of 24 questions were written after consultation with the Associate Professor of Teaching and Research at The University of Queensland School of Dentistry and the survey was pilot tested on undergraduate and postgraduate Dentistry students. The survey was divided into three sections: demographics; use of imaging services including external referrals and in-house imaging reporting protocols; and satisfaction as well as preference of image reporting. An outline of the survey is attached as a supplemental appendix. The research was approved by The University of Queensland Dental Sciences Research Ethics Committee (1630).

Survey Participants and procedures

The survey was advertised to dentists on social media and via professional associations.

Table 2 lists the professional associations that were contacted to request involvement in the survey. The professional associations that responded were sent a link to the survey to disseminate amongst their members.

Table 3 shows the Facebook dentist groups that were provided with the survey. The primary researcher sent a link with the survey to all Dentist contacts on Facebook available to them at the time. The link to the survey was posted with a brief description of the study.

The link to the survey was posted according to the recommendations outlined by CoSchedule,[18] which advised Facebook engagement would be highest Thursday through Sunday, at specific times including 9am, 1pm and 3pm.

Using a sample size calculator[19] the researchers input a margin of error of 5%, a confidence level of 95%, and a total population size of 22 457 dental practitioners in Australia according to the numbers obtained from AHPRA.[20] The recommended minimum sample size was 378.

Analysis

Dental student responses were disregarded. Responses were categorised by type of dentistry practice: general dental practitioners, specialists and DClinDent Students. Only responses from practitioners currently working or were trained in Australia were included (98% of the total responses). Responses from DMFRs were excluded due to potential bias (Fig. 1). The data was

collected from the surveys after being downloaded from the Checkbox survey tool. Principal place of practice of the practitioners were categorised according to State, Territory, or overseas (Fig. 2).

The respondents were split into General Dentists, and Dental Specialists. Specialists were split up into various subgroups and respondents were asked to disclose whether they worked in private or public practice predominantly.

Respondents were asked if they were satisfied with the quality of their reporting. Responses were originally scaled from 1 to 5, with 5 representing the most satisfaction. The satisfaction categories were then further narrowed into "Satisfied" and "Not satisfied" with those that were "Neutral" and below reclassified as those that were "Not satisfied".

For those practitioners that were unsatisfied, they were asked to elaborate why they felt that way. Initially the practitioners were asked to choose from a selection of pre-determined answers. Respondents were also given an option to give their own opinion under an "other" response.

Data was analysed using IBM SPSS version 25. Frequencies and percentages were calculated for categorical variables. Cross-tabulations were used to calculate the row percentages for demographic variables stratified by; who currently performs the imaging reporting; satisfaction with current imaging processes; and preference for who performs the imaging. Chi-square test of independence was used for comparing the categorical variables to the outcome variables or the Mantel-Haenszel Test of trend when the demographic variable was ordinal. Statistical significance was set at $p < 0.05$.

Open-ended questions were analysed via a combination of both deductive and inductive approaches[19] to minimise any bias or presumptions on the part of the researchers. A thematic analysis was also used to go through the responses. Two of the researchers coded the transcripts to look for common themes and categories that were encountered in the responses. Through consensus and correlation with the themes discussed in the closed questions, the researchers coded the open-ended responses appropriately.

RESULTS

Demographics

There were 399 responses out of 2,054 opened survey links, giving a 19% response rate.

Males made up 56.9% of the respondents and most respondents were under the age of 40. Table 4 summarises the findings of demographics, reporting arrangements, and satisfaction with reporting. Almost one-third of the respondents were in Queensland and approximately 72% of respondents worked in private practice. Most respondents were trained in Australia, followed by New Zealand and the United Kingdom (Fig. 3).

The split between dental groups showed that approximately 65% of the respondents were general dentists. The largest subgroup of specialist respondents by percentage were Endodontists and Periodontists, followed closely by Paediatric Dentists. The lowest percentage of respondents relative to their population in Australia were Orthodontists and Prosthodontists (Fig. 4).

The type of dentist, including their specialty, age, gender, years of practice, work sector, location in Australia and country of primary qualification are summarised in Table 5. Approximately 82.5% of respondents were aware of the existence of the specialty of DMFR, and 35.1% had lectures in their primary dental degrees by DMF Radiologists. Only 38.8% of respondents did not have access to any extra-oral imaging device at their place of work.

Reporting Arrangements

Table 4 shows that only 17% of the respondents had DMFR Reports exclusively. Queensland was theorised to be the most common state in which DMFR services were utilised, but 40% and 41.7% of the Australian Capital Territory (ACT) and Western Australian practitioners respectively were using DMFR reports. Regarding imaging and reporting protocols, 34.8% of practitioners self-reported without writing up a full report, 5.8% self-reported and wrote a full report, and 1.5% did not take any notes for the radiographs (Fig. 5).

Reporting satisfaction

Satisfaction rates of those who were sure of who reported their imaging were compared, highlighting differences in satisfaction with DMF radiology reports and medical radiology reports; showing a correlation between decreased satisfaction with those who utilised medical radiology reports, as well as increased satisfaction with those that utilised DMF radiology reports (Fig. 6).

Tables 6 and 7 show the satisfaction of practitioners correlated with certain characteristic variables such as the type of dentist, age group, years of practice, work sector, place of practice, place of qualification and reporting radiologist type.

Table 7 shows satisfaction of dental practitioners regarding reporting. More than half of General Dentists (80.2%) and Specialists Dentists (58.6%) were not satisfied with their reporting.

Unsatisfied practitioner responses that gave detailed reasons for dissatisfaction as seen in Figure 7. The “other” responses for lack of satisfaction are seen in Figure 8. These other reasons for dissatisfaction included 13.5% of respondents believing that the radiologist would not know the radiograph better than they would; 9.8% believing they were not getting enough detail in their reports; 8.8% being indifferent to radiology reports; and 5.8% were unhappy with report templates.

It was shown that satisfaction levels for 4.5% of all respondents would not improve with a DMFR performing dental reports, while the majority expected that their satisfaction would change positively (Fig. 9).

Preference of Reporting Radiologist

Table 8 summarises preference of DMFR versus a Medical Radiologist, by certain characteristic variables. Most general dentists (93.1%) and dental specialists (85.9%) preferred a DMFR report as opposed to a medical radiology report, with a significant difference between both groups (p-value 0.038). There was an age-related trend where increased maturity of the dental practitioner corresponded with reduced preference for a DMFR report. These results were not significantly different whether the dentist or specialist was currently utilising DMFR or medical radiology reporting, whether they were currently satisfied or not with their reporting, or whether they were in Queensland or outside Queensland.

Complaints and recommendations

In terms of how external reports should be improved, the open-ended recommendations were classified into themes and coded (Fig. 10). Commonly, referrers wanted "More dental specific knowledge and/or detail by [the] Medical Radiologists" or "Specifically request[ed] DMFR reports in future".

DISCUSSION

This study examined the awareness of practitioners regarding the existence of the specialty of DMFR; the prevalence of "self-reporting" in extraoral dental radiology; the subjective satisfaction with outsourced reporting; any potential preference for DMFR reports versus Medical Radiology reports; and whether practitioners felt there was a need for DMFR as a specialty. This study also investigated whether dentists working in Queensland were more likely to prefer DMFR services due to the concentration of DMF Radiologists in the state.

The respondents to the survey were divided as dental general dental practitioners versus dental specialists, with the ratio being approximately 2:1. These numbers are relatively consistent with the numbers recorded by AHPRA(60:40).

Practitioner awareness of the specialty of DMFR was approximately 80%. The reduced awareness of the specialty of DMFR may be due to the specialty being relatively young; the small concentration of registered DMFRs in Australia; and may be in part due to only 35.1% of dental practitioners being lectured by a DMF Radiologist.

Over 60% of respondents had either a Panoramic radiography or Orthopantomogram machine (OPG) or CBCT. Further to this, the majority of those that had their own machine did not write any radiology reports for imaging performed in-house. This is consistent with the hypothesis that many dentists with in-house imaging would be self-reporting. A subgroup of participants (7.5%) had arrangements for reporting to be referred externally.

Approximately 46% of respondents were referring externally for CBCT and close to 70% were referring for panoramic radiography imaging to be performed at a radiology practice on a weekly basis.

While Medicare-funded CBCT scans have decreased due to changes in legislation; there is still a high number of panoramic radiographs being taken in external radiology practices, with almost one million scans rebated annually over the past five years.[21] Brown and Monsour in 2014 also hypothesised there would subsequently be an increase in privately owned CBCT machines and in-house imaging being performed.[22]

Currently, there are practicing DMFRs in the states of Queensland, Western Australia, and Victoria. This appears consistent with the fact that a minority of Australian dental practitioners are utilising DMFR services. This may be because a substantial subgroup is unaware of the specialty, have not been lectured by a DMFR, or are simply in a state where the service is not offered. This may also be why there is a large amount of self-reporting dental practitioners.

If not externally referring, there are issues with self-reporting from a medicolegal perspective. The literature has shown that issues with self-reporting and in-house radiological examinations can involve pathology not being picked up,[12, 13] poor awareness of radiation exposure,[14] radiographic errors[23] and not recognising imaging faults.[15]

Dental practitioners are responsible for any dosage of radiation given to the patient, and are responsible for diagnosis of the whole dataset.[11] It is essential that practitioners explain radiation dosages with any radiographic examination to the patient, as well as explaining risks involved. Dental practitioners must be aware of all non-dental diagnoses that can be made from the image, or have those regions properly assessed by a DMF radiologist or medical radiologist.

Of greatest importance is that any practitioner reporting a radiology report of the maxillofacial region should be held to the same standard of a DMF Radiologist; as they would be held to the same standard as any other specialist. This is emphasised by the American Academy of Oral and Maxillofacial Radiology (AAOMR).[24] The patient should be entitled to getting the best possible service, and medico-legally, the general dental practitioner (GDP) will be expected to offer a service at the same standard as the specialist if they choose not to refer.

The AAOMR also emphasises that self-reporting practitioners are responsible for interpretation and findings no different to biopsies being accompanied by a pathology report.

Also, from a medico-legal perspective, every image taken on-site needs to be interpreted and accompanied by a written report to be placed in a patients file. Our current survey, while limited, highlights the lack of proper protocols being followed in self-reporting practices.

It is understandable, however that for most Australian dentists, access to a DMF radiologist can be quite difficult.

A potential solution to this problem may be dedicated DMFR teleradiology/teledentistry services. These services have been implemented in other parts of the world with success.[25,26] There are already several "off-site" DMF radiologists in Australia practicing teleradiology from different locations. This also happens quite frequently with medical colleagues where medical radiology reports may be done offshore.

Regarding satisfaction, most respondents were "not satisfied" with the quality of reporting they were provided. Most respondents believed they would be more satisfied with DMF Radiologist reports, and the vast majority of respondents preferred a DMFR report over a medical radiology report. Of the respondents, a majority also believed there would be value incorporating DMFR into daily clinical practice.

There was a significant difference in preference for DMFR services for general dentists compared to dental specialists. More general dentists (93.1%) preferred DMFR reports compared to dental specialists (85.9%). These figures are higher than the numbers that Alcox reported in 1972,[5] with an increased desire for DMFR, possibly due to increased awareness of the specialty.

There was also an age-linked trend, with older clinicians being less likely to prefer a DMFR report. Private practice dentists were also more likely to prefer DMFR reports compared to those working only in the public sector. The hypothesis that Queenslanders were more likely to prefer DMFR services was found to be unsupported, with no significant difference between the other states and Queensland.

The data is consistent with the hypothesis that most dental practitioners were unsatisfied with their reporting arrangements, and that most either self-reported or neglected the reports they were given previously.

The data also showed that irrespective of who was currently reporting the practitioners' imaging, the preference for DMFR reports remained consistent. Interestingly, the data showed that satisfaction with reporting did not affect preference for radiologist (See Table 8); *meaning that even those that currently had DMF radiology services and were unsatisfied still preferred a DMFR report over a medical radiology report*. There was also a correlation with satisfaction and reporting radiologist. Those with a DMFR were more likely to be satisfied than a medical radiologist.

The responses for how reporting could be improved, as well as why there was a lack of satisfaction in reporting were open-ended and were divided into sub-groups. Many dental practitioners complained of lack of detail and dental expertise in Medical Radiology reports; and a common complaint was that many reports appeared to be a template or pre-written.

More access to DMFR reports was also a common concern, which is consistent with the hypothesis that many dental practitioners would utilise DMFR services if available.

The fact DMFR reports are more preferred and the high rate of dissatisfaction with medical radiology reporting services may be due to several factors.

The first is a lack of medical radiologist knowledge in dentistry, which may be attributed to a lack of dental-focused education given to medical radiology registrars and medical doctors in general. Consequently, reports on dental imaging may contain incorrect terminology, or more significantly; pathology that was not reported on by the medical radiologist. Many respondents complained of "missed pathology" by the medical radiologist that the dental practitioner subsequently observed.

The next issue was more access to DMFR reporting. As stated above, the limited number of DMF radiologists has made access for most practitioners across Australia difficult.

Another common issue was "template reporting", several respondents had an issue with template reports being inappropriate, irrelevant, or completely incorrect. This was a common problem raised, in that many believed that template reports were given to them without the medical radiologist addressing what the image was referred for.

The findings highlight the need for either of two recommendations: either in-depth dentistry being taught at a medical school level or at a medical radiology training level; or alternatively, more DMF Radiologists "on the ground" in other states. This could potentially lead to less "template reporting" by medical radiologists and a widespread increase in standard of reporting of maxillofacial imaging.

The issue of insufficient DMFR services may be due to the low number of DMF Radiologists in the population, and partly due to the concentration of specialists in Queensland. According to the data given by AHPRA,[20] While 7 of the 11 DMF radiologists are located in Queensland, the state contains less than 20% of all the dental practitioners in Australia; whereas New South Wales, Victoria and the ACT make up almost 55% of the population. These disproportionate numbers mean that 63% of the DMFRs in Australia service 20% of the population.

There are also issues with cost that may act as a deterrent for many referrers or radiology employers. Currently, due to Medicare billing regulations, there is no way for DMF radiologists to receive rebates for radiology reporting, and most are employed by private radiology practices. Outside Queensland and WA, DMFR employment in private radiology practices is almost non-existent.

Private Health Insurance rebates for radiology reporting are relatively low compared to other services or may not be offered at all in some cases. The item codes for Panoramic Radiographs (037) include interpretation, but Cone Beam Scan scans and interpretation involve separate item numbers (087-091).[30] Sending to a bulk-billed radiology practice means no cost to patients; but sending to a dedicated DMFR via teleradiology incurs a cost, while self-reporting is of no financial cost. This could be changed in future to allow for more incentive to refer externally for radiology reporting.

There are also some limitations to the research. Precise numbers or percentages of response rates are not easily calculated, and exposure to the survey is based upon Facebook metrics. The divisions within the specialties are also disproportionate. The largest dental specialty group in Australia are Orthodontists; and they are poorly represented in the results. Similarly, Prosthodontists are also poorly represented.

Recent literature has shown however, that low response rates in some groups are only marginally less accurate than larger response rates,[27] particularly in homogenous professional groups.[28] There is also evidence that email survey response rates decline over time.[29]

CONCLUSIONS

While the number of respondents was limited, there is evidence of dissatisfaction of dentists with their dental extraoral reporting arrangements, with many dentists self-reporting. There is evidence that many dentists and dental specialists would prefer DMFR services over medical radiology services irrespective of geographic location, current satisfaction with radiology reports, or current reporting arrangements. In future there should be more thought given to either adding more dental specific education in medical radiology training or increasing the presence of DMF Radiologists in private practice in Australia. It is imperative that dental imaging is no longer – “State of Dentition as shown”.

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Tables

Table 1. Medicolegal responsibilities for the dental practitioner in relation to radiology

Medicolegal responsibilities for the dental practitioner involving radiology*
1. Radiation Dosages with CBVT and panoramic film must be explained
2. There is an increased duty to explain dosages and risks of radiographs on dentist's own premises
3. Dentists who record panoramic radiographs need to take responsibility for all non-dental diagnosis or have them assessed by, or referred to a DMF Radiologist or Radiologist
4. Dentists who record small volume CBVT need to assess whether a referral to a DMF Radiologist/Radiologist is appropriate
5. Dentists who record large volume CBVT need to refer all data sets to DMF Radiologists/Radiologists for review, as they have the highest medicolegal risk
6. There needs to be thorough discussion of dosage of CBVT for paediatric patients
7. If the dentist has a CBVT on site, it is not advisable to expose paediatric patients to CBVT
8. Dentist "self-reports" must be held to a similar standard as a specialist report

*Adapted from paper by Wright[11]

Table 2. Titles and abbreviations of professional associations contacted

Organisation Title	Abbreviation
Australian Dental Association	ADA
Australian Society of Orthodontists	ASO
Academy of Australian and New Zealand Prosthodontists	AANZP
Oral Medicine Academy of Australasia	OMAA
Australian and New Zealand Academy of Periodontists	ANZAP
Australian and New Zealand Academy of Oral and Maxillofacial Surgeons	ANZOMS
Australian and New Zealand Society of Paediatric Dentistry	ANZSPD
Australian Society of Endodontology	ASE

Table 3. Social Media Groups where survey was posted

Social Media Group
DPR
Next Generation Dentists
Young Dentist Hub
Perth Oral Medicine – Tongue in Cheek
Melbourne Oral Medicine
Sydney Oral Medicine

Table 4. Univariate distribution of characteristics examined by the survey

Characteristic	n (percent)
Total number	*399*
Type of dentist	
General Dentist	260 (65.2)
Gender	
Male	227 (56.9)
Age group	
Less than 30 years	144 (36.1)
30 to 40 years	156 (39.1)
40 to 50 years	43 (10.8)
Greater than 50 years	56 (14)
Years practicing as Dentist or specialist	
Less than 2 years	42 (10.5)
Between 2 and 5 years	82 (20.6)
Between 5 and 10 years	130 (32.6)
Between 10 and 20 years	71 (17.8)
More than 20 years	74 (18.5)
Work sector	
Private	287 (71.9)
Place of practice	
Queensland	127 (31.8)
Access to radiology machine in-house	
OPG	156 (39.1)
CBCT	32 (8.0)
OPG and CBCT	52 (13.0)
Other	4 (1.0)

No machine	155 (38.8)
Current reports completed by	
Dental Radiologist	69 (17.3)
Medical Radiologist	148 (37.1)
Both	77 (19.3)
Unsure	73 (18.3)
Other	8 (2.0)
Reporting Satisfaction	
Dissatisfied	100 (25.1)
Mildly dissatisfied	79 (19.8)
Neutral	95 (23.8)
Mildly satisfied	44 (11.0)
Satisfied	58 (14.5)
Prefer a DMFR report	341 (85.5)
Believe there is clinical value in having a DMFR available	296 (74.2)

OPG = Orthopantomogram, in this case – referring to any type of panoramic radiography; CBCT = Cone Beam Computed Tomography/Cone Beam Volumetric Tomography; DMFR report = Dento-maxillofacial Radiologist Report

Table 5. Percentage distribution of who currently performs imaging based on characteristic variables

Characteristic	n	Percentage who perform imaging currently			
		Dental Radiologist	Medical Radiologist	Both	Unsure or other
Type of Dentist					
General Dentist	248	14.1	42.3	15.7	27.8
Specialists	127	26.8	33.9	29.9	9.4
Sex					
Male	215	17.7	41.9	21.4	19.1
Female	160	19.4	36.3	19.4	25
Age groups					
< 30 years	136	16.9	34.6	22.1	26.5
30 - 40 years	148	16.9	45.3	14.9	23
40 - 50 years	42	26.2	38.1	19	16.7
> 50 years	49	20.4	36.7	34.7	8.2
Years of practice					
Less than 2 years	38	15.8	34.2	13.2	36.8
Between 2 and 5 years	80	11.3	42.5	21.3	25
Between 10 and 20 years	66	24.2	40.9	19.7	15.2
More than 20 years	67	20.9	35.8	31.3	11.9
Work Sector					
Public	69	10.1	37.7	27.5	24.6
Private	272	19.9	39.3	18.8	22.1
Evenly Spread	26	30.8	34.6	19.2	15.4
University	6	0	66.7	33.3	0
Defence Force	2	0	100	0	0
State in Australia					
Queensland	122	24.6	20.5	34.4	20.5
Other states	253	15.4	48.6	13.8	22.1

Country of primary qualification					
Australia	320	18.4	39.1	21.3	21.3
Overseas	55	18.2	41.8	16.4	23.6

NOTE: Percentages may not add to 100% due to rounding.

Table 6. Detailed distribution of frequency and percentage of satisfaction by characteristic variables.

Characteristics	Satisfied	Mildly Satisfied	Neutral	Mildly Dissatisfied	Dissatisfied
Type of dentist					
General dentist	28 (11.3)	21 (8.5)	66 (26.6)	50 (20.2)	83 (33.5)
Specialists	30 (23.4)	23 (18)	29 (22.7)	29 (22.7)	17 (13.3)
Age group					
Less than 30 years	16 (11.8)	17 (12.5)	45 (33.1)	23 (16.9)	35 (25.7)
30 to 40 years	20 (13.5)	12 (8.1)	30 (20.3)	39 (26.4)	47 (31.8)
40 to 50 years	10 (23.8)	4 (9.5)	7 (16.7)	9 (21.4)	12 (28.6)
50 years or more	12 (24.0)	11 (22)	13 (26)	8 (16)	6 (12)
Years of practice					
Less than 2 years	3 (8)	4 (11)	15 (40)	9 (24)	7 (18)
2 to 5 years	8 (10)	10 (13)	22 (28)	10 (13)	30 (38)
5 to 10 years	16 (13)	11 (9)	28 (23)	36 (29)	33 (27)
10 to 20 years	14 (21)	6 (9)	15 (23)	12 (18)	19 (29)
More than 20 years	17 (25)	13 (19)	15 (22)	12 (18)	11 (16)
Work sector					
Private	42 (15.4)	30 (11)	65 (23.9)	52 (19.1)	83 (30.5)
Other	16 (15.4)	14 (13.5)	30 (28.8)	27 (26)	17 (16.3)
Place of practice					
Queensland	24 (19.7)	26 (21.3)	30 (24.6)	18 (14.8)	24 (19.7)
Not Queensland	34 (13.4)	18 (7.1)	65 (25.6)	61 (24)	76 (29.9)

Place of qualification					
Australia	47 (14.6)	39 (12.1)	77 (24)	69 (21.5)	89 (27.7)
Not Australia	11 (20.0)	5 (9.1)	18 (32.7)	10 (18.2)	11 (20)
Reporting currently completed by					
Dental Radiologist (DMFR)	31 (44.9)	15 (21.7)	17 (24.6)	4 (5.8)	2 (2.9)
Medical Radiologist	7 (4.7)	2 (1.4)	29 (19.6)	44 (29.7)	66 (44.6)
Both	15 (19.5)	22 (28.6)	22 (28.6)	11 (14.3)	7 (9.1)
Unsure or other	5 (6.2)	5 (6.2)	26 (32.1)	20 (24.7)	25 (30.9)

NOTE: Percentages may not add to 100% due to rounding.

Table 7. Frequency and percentage of satisfaction by characteristic variables.

Characteristic	**Satisfied n (%)**	**Not Satisfied n (%)**	**P-value**
Type of dentist			
General Dentist	49 (19.8)	199 (80.2)	**< 0.001**
Specialists	53 (41.4)	75 (58.6)	
Age group			
Less than 30 years	33 (24.3)	103 (75.7)	
30 to 40 years	32 (21.6)	116 (78.4)	**0.003**[†]
40 to 50 years	14 (33.3)	28 (66.7)	
50 years or more	23 (46)	27 (54)	
Years of practice			
Less than 2 years	7 (18.4)	31 (81.6)	
2 to 5 years	18 (22.5)	62 (77.5)	
5 to 10 years	27 (21.8)	97 (78.2)	**0.001**[†]
10 to 20 years	20 (30.3)	46 (69.7)	
More than 20 years	30 (44.1)	38 (55.9)	
Work sector			
Private	72 (26.5)	200 (73.5)	0.69

Other	30 (28.8)	74 (71.2)	
Place of practice			
Queensland	50 (41)	72 (59)	**< 0.001**
Not Queensland	52 (20.5)	202 (79.5)	
Place of qualification			
Australia	86 (26.8)	235 (73.2)	0.74
Not Australia	16 (29.1)	39 (70.9)	
Reporting currently completed by			
Dental Radiologist (DMFR)	46 (66.7)	23 (33.3)	
Medical Radiologist	9 (6.1)	139 (93.9)	**< 0.001**
Both	37 (48.1)	40 (51.9)	
Unsure or other	10 (12.3)	71 (87.7)	

NOTE: Percentages may not add to 100% due to rounding.

[†]Mantel-Haenszel test of trend

Table 8. Frequency and percentage for preference of who completes the radiology report by characteristic variables.

Characteristic	Prefer DMFR n (%)	Prefer MR or indifferent n (%)	P-value
Type of dentist			
General Dentist	231 (93.1)	17 (6.9)	**0.038**
Specialists	110 (85.9)	18 (14.1)	
Age group			
Less than 30 years	128 (94.1)	8 (5.9)	
30 to 40 years	134 (90.5)	14 (9.5)	**0.043[+]**
40 to 50 years	36 (85.7)	6 (14.3)	
50 years or more	43 (86)	7 (14)	
Years of practice			
Less than 2 years	36 (94.7)	2 (5.3)	
2 to 5 years	74 (92.5)	6 (7.5)	
5 to 10 years	115 (92.7)	9 (7.3)	0.09[†]
10 to 20 years	56 (84.8)	10 (15.2)	
More than 20 years	60 (88.2)	8 (11.8)	
Sector of work			
Public	62 (88.6)	8 (11.4)	
Private	253 (93)	19 (7)	**0.002**
Evenly Spread	18 (69.2)	8 (30.8)	
University or defence force	8 (100)	0 (0)	

Place of work			
Queensland	116 (95.1)	6 (4.9)	0.06
Not Queensland	225 (88.6)	29 (11.4)	
Place of primary qualification			
Australia	288 (89.7)	33 (10.3)	0.14
Not Australia	53 (96.4)	2 (3.6)	
Currently reports			
Dental Radiologist	65 (94.2)	4 (5.8)	
Medical Radiologist	132 (89.2)	16 (10.8)	
Both	70 (90.9)	7 (9.1)	0.65
Unsure	65 (89)	8 (11)	
Other	8 (100)	0 (0)	
Satisfaction level with current reporting			
Dissatisfied	92 (92)	8 (8)	
Mildly Dissatisfied	72 (91.1)	7 (8.9)	
Neutral	85 (89.5)	10 (10.5)	0.44[†]
Mildly Satisfied	42 (95.5)	2 (4.5)	
Satisfied	50 (86.2)	8 (13.8)	

[†] Mantel-Haenszel Test of trend

NOTE: Percentages may not add to 100% due to rounding.

Figure Legends

Figure 1. Survey flow chart showing exclusions

Figure 2. Geographical Distribution of respondents place of practice. (NSW = New South Wales, ACT = Australian Capital Territory)

Figure 3. Country where respondents earned primary dental qualifications and the numbers per country (UK = United Kingdom)

Figure 4. Respondents categorised according to type of practitioner.

Figure 5. Respondents' imaging and reporting protocols.

Figure 6. Satisfaction of practitioners who exclusively utilised DMF Radiologists compared to those who utilised Medical Radiologists.

Figure 7. Satisfaction and dissatisfaction with reporting, including reasons for dissatisfaction.

Figure 8. Open-ended answers to reasons for dissatisfaction with reporting. (DMFR = Dento-maxillofacial Radiologist, MR = Medical Radiologist)

Figure 9. Respondent perception of whether satisfaction would change with a DMFR (Dento-maxillofacial Radiologist).

Figure 10. Respondent recommendations in changing external reports. (DMFR = Dento-maxillofacial Radiologist, MR = Medical Radiologist**)**

Figures

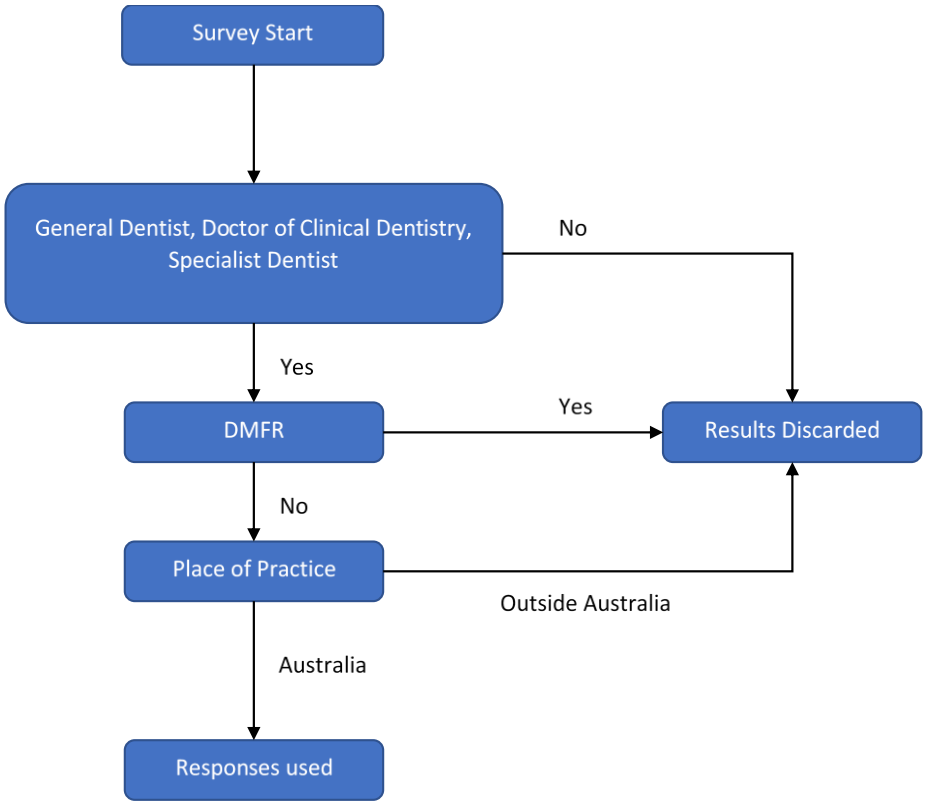
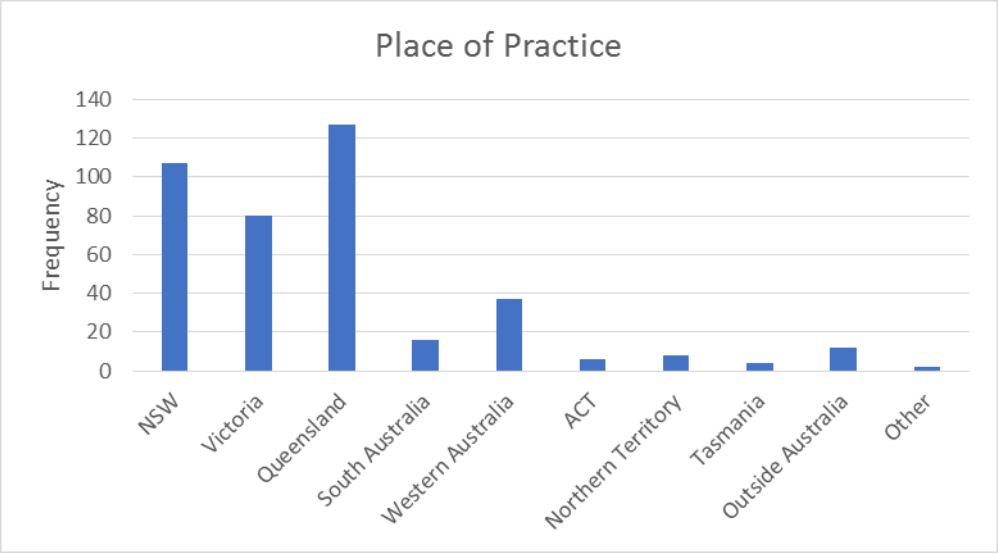


Figure 1



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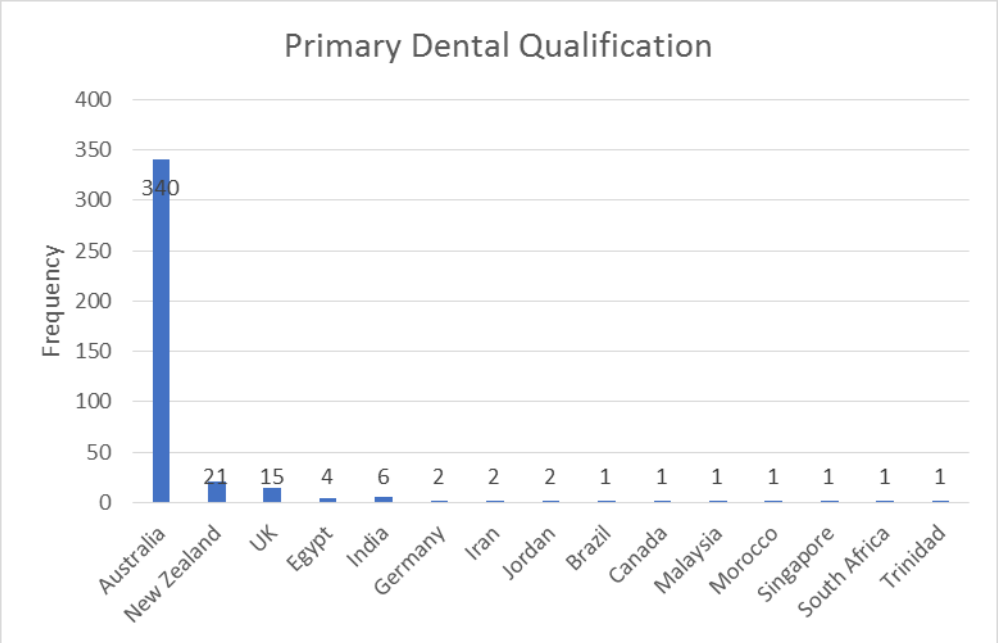

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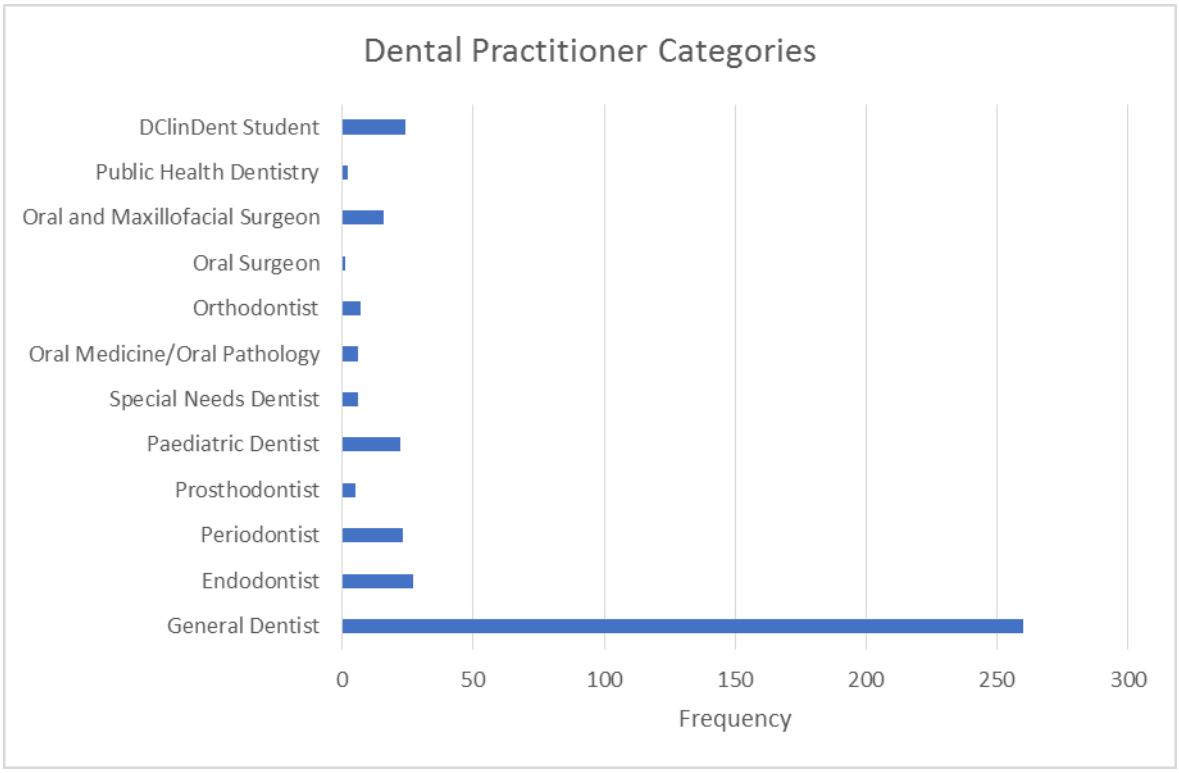

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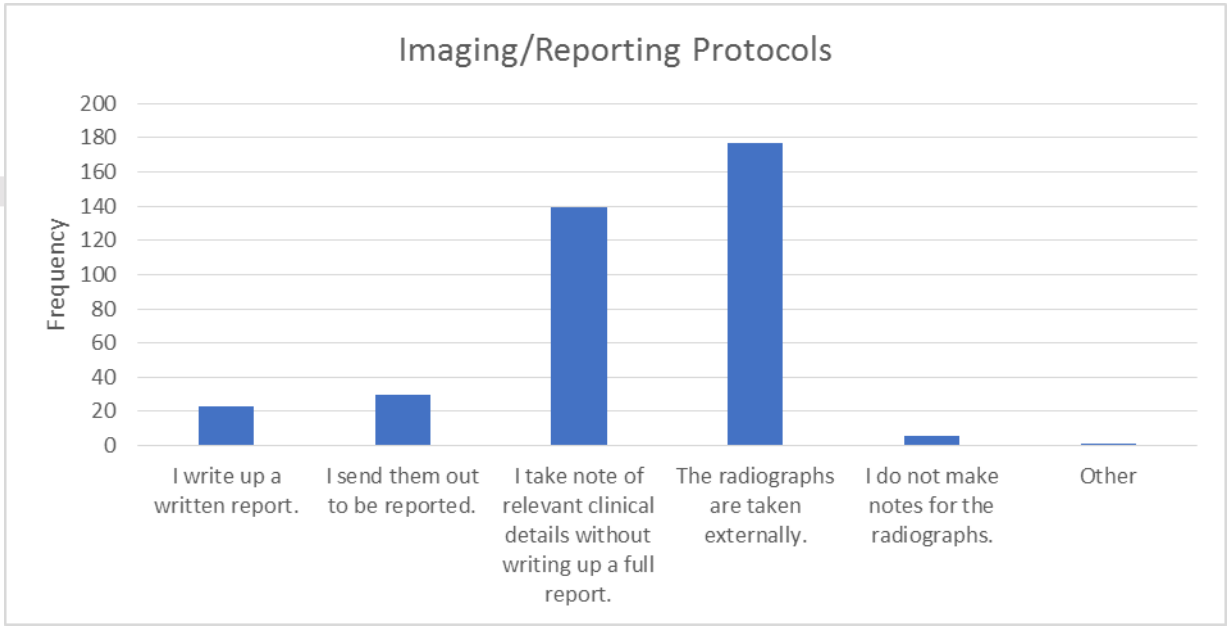

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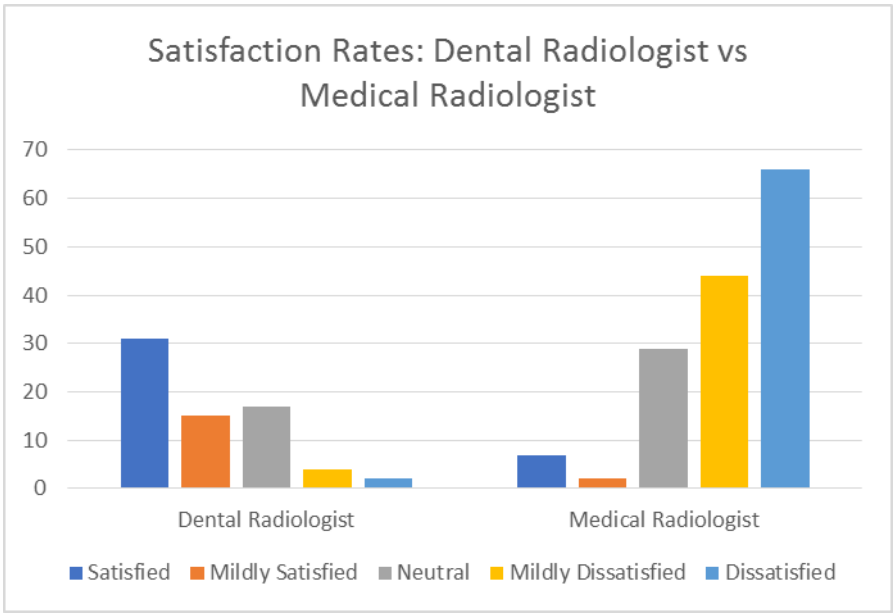

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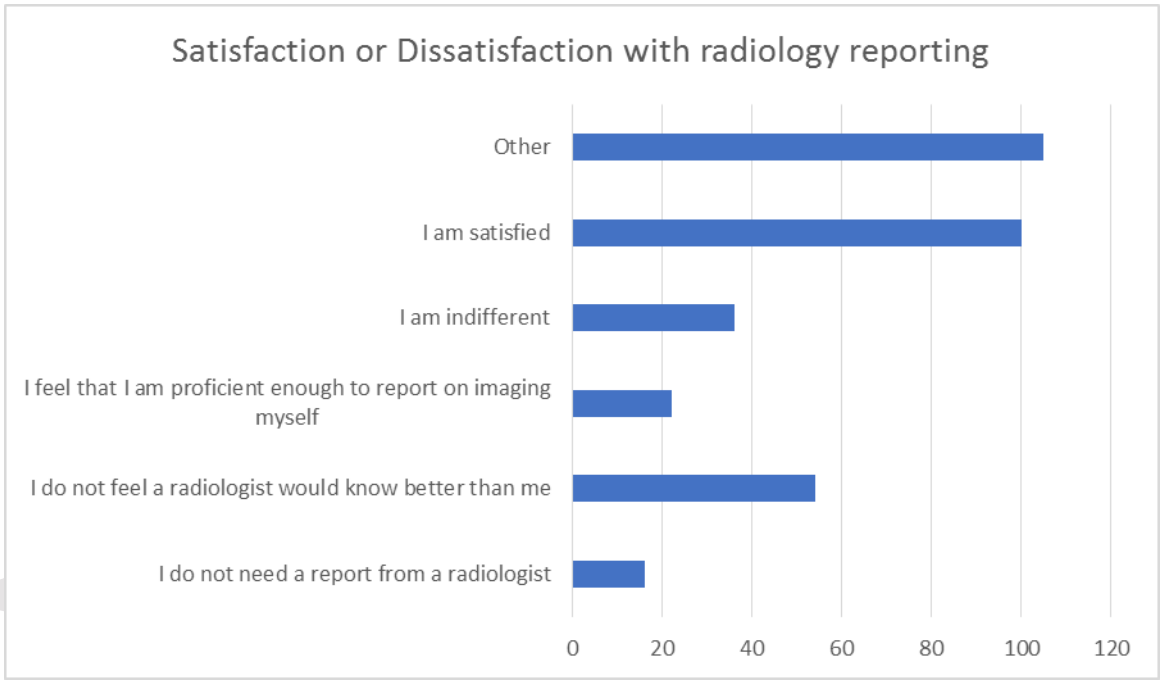

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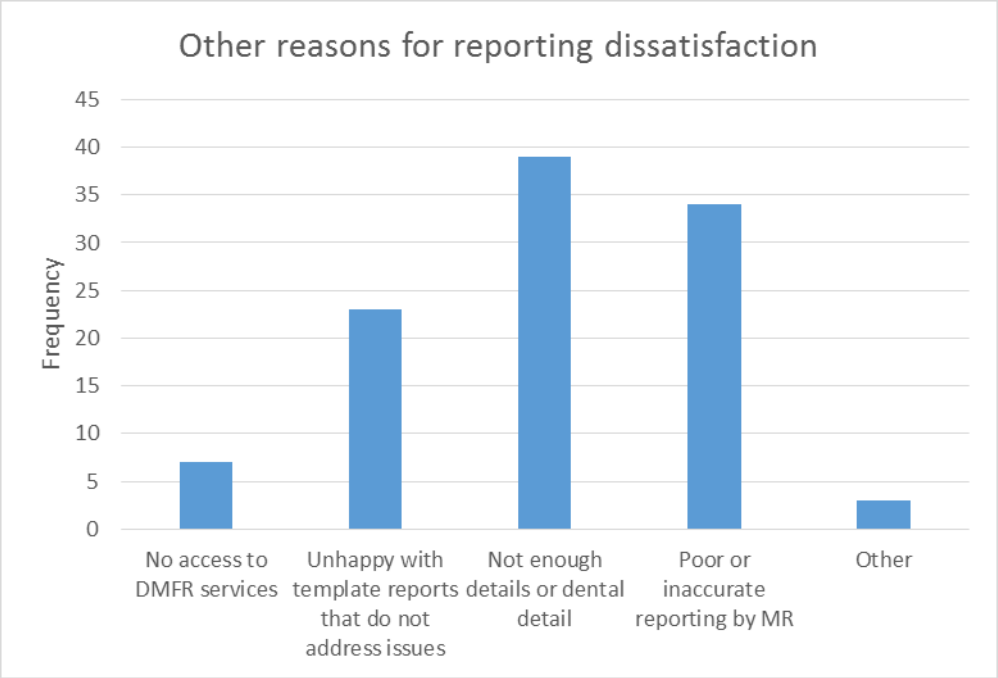

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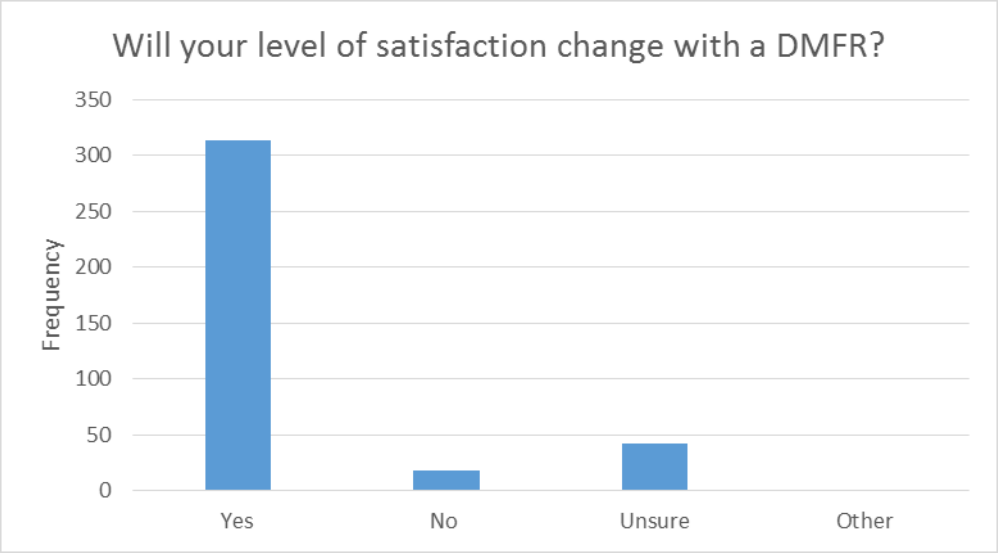

Figure 9

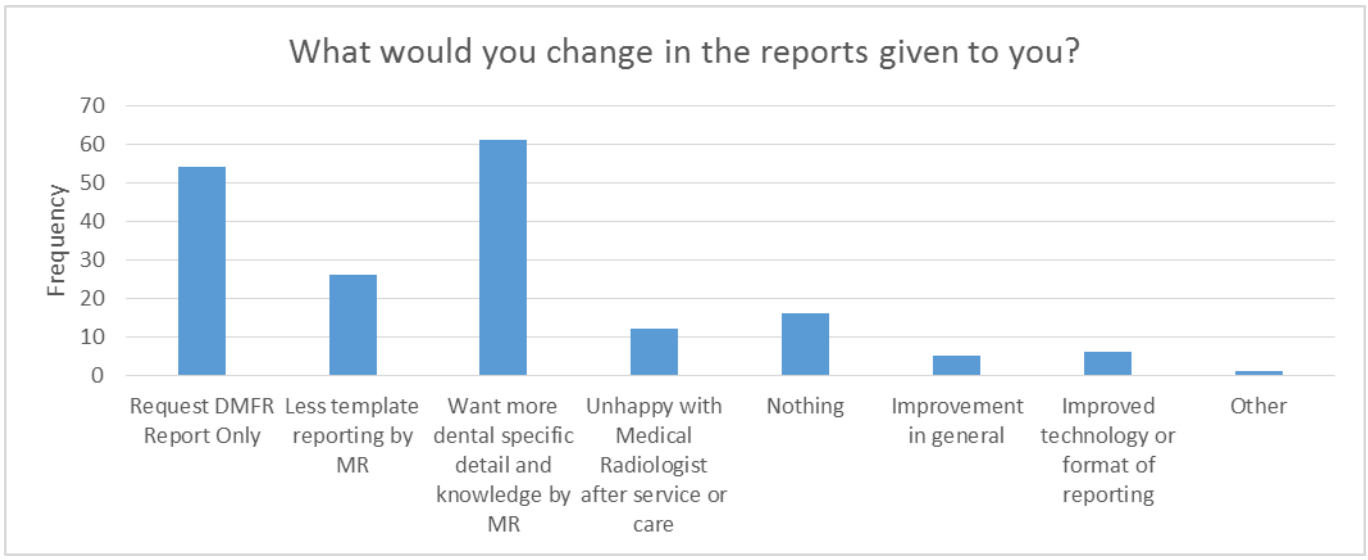

Figure 10

Appendix

Appendix 1: Survey Questions

1. Are you a General Dentist, a Specialist, a Student, or no longer practicing?
2. What is your gender?
3. How old are you?
4. How many years have you been practicing as a Dental Professional?
5. In which sector are you predominantly working?
6. Where is your principal place of practice?
7. In which country did you complete your primary Dental qualification?
8. At which institution did you complete this training?
9. Are you aware of the specialty of Dento-maxillofacial Radiology (DMFR) in Australia?
10. Were your lectures in Dental Radiology in University given by a:
11. Does your principal place of work have an OPG machine or CBCT machine?
12. In an average week, how many OPGs do you take in house?
13. In an average week how many CBCT's do you take in house?
14. What is your protocol for your OPG, CBCT and Lateral Ceph radiographs taken in house?
15. In an average week, how many OPGs do you refer to an external Radiology practice?
16. In an average week, how many CBCTs do you refer to an external Radiology practice?
17. In an average week, how many non-conventional radiographs, not including OPG and CBCT do you refer to an external Radiology practice?
18. If you refer to an external Radiology practice for your imaging, who reports on your radiographs?
19. How satisfied are you with the quality of **reporting** provided to you by external professionals?
20. If you answered that you would not be satisfied, why do you feel that way?
21. Do you believe your level of satisfaction would change if you had a Dento-maxillofacial Radiologist reporting your films?
22. Is there anything you would like to change in the way external reports are done?
23. Would you prefer a Dento-maxillofacial Radiologist as opposed to a Medical Radiologist reporting your radiographs?
24. Do you think there is any value or relevance incorporating a DMFR into your everday practice?